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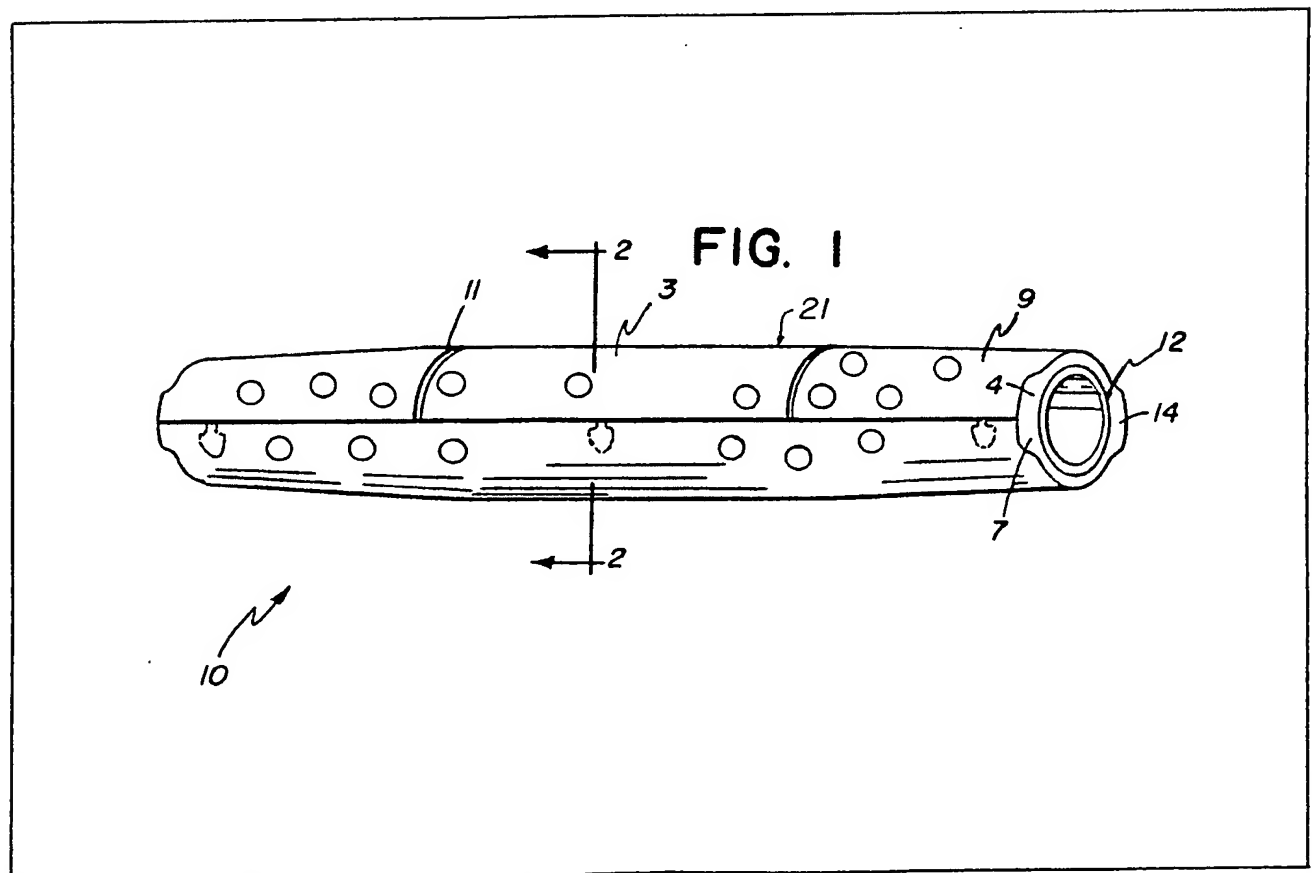
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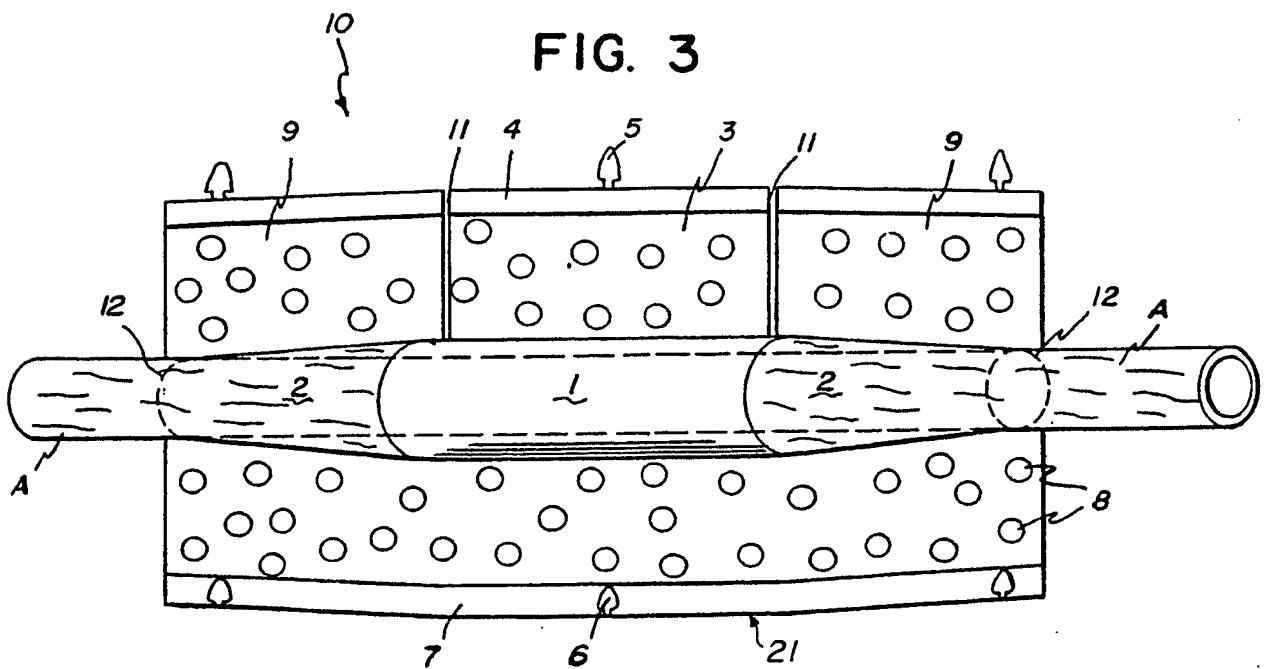
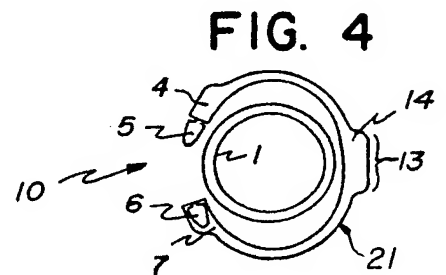
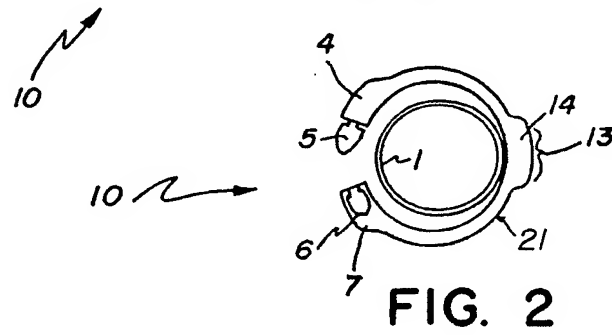
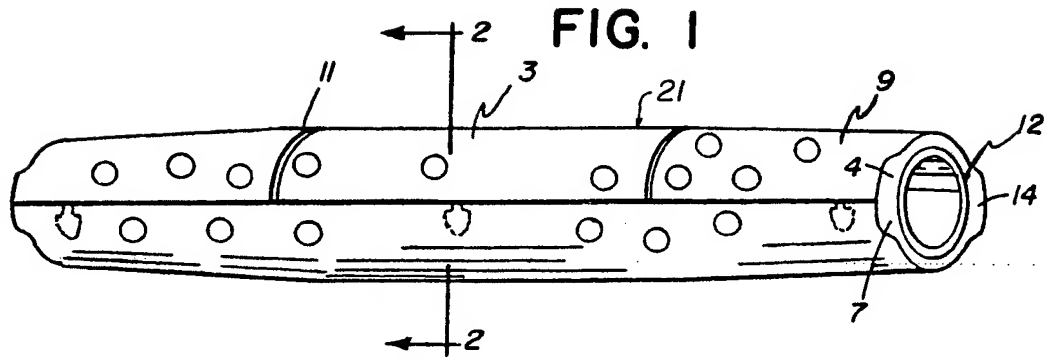
## (54) Micro-arterial sleeve-grip

(57) A device for joining together separated arteries, lumen or the like includes an innertube of substantially cylindrical configuration having end portions which taper somewhat and terminate at opposed extremities in a fine feathered end. Attached to the center cylindrical portions is a sleeve grip mechanism which extends over

the tapered portions as well so that when an artery is slidably disposed over the tapered portion of the innertube, the sleeve grip can wrap around the central cylindrical portion and the tapering portion, and opposed ends of the sleeve grip can be fastened together to securely affix the dissociated artery to the central cylindrical portion thereby repairing the artery and allowing the flow of blood to recommence therethrough.



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## SPECIFICATION

### Micro-arterial sleeve-grip

#### Background of the Invention

5 The traditional techniques associated with rejoining severed tubular organs in a body comprises sewing together the severed area with very fine thread that is approximately three times finer than human hair, performed with a magnifying device, so that the work can be accurately  
10 monitored. It should be apparent, that with precision work of this nature, a substantial amount of time is required to join together two such articles, and in situations such as these, time is essential in effecting the rejoining since an area  
15 deprived of blood can suffer irreversible damage. The time demands become substantially more aggravated when the nature of the injury is quite extensive, and plural arteries require joining, for example when a hand is severed. Currently, an  
20 excess of twenty hours is required to rejoin a severed hand, and therefore the hand to be joined should be preserved by packing in ice or the like so as to increase the likelihood that the rejoining of the hand will suffer from a minimal amount of  
25 irreversible damage.

#### Summary and Objects of the Invention

Accordingly, the ensuing detailed invention is directed to an apparatus for reducing the amount of time for joining severed arteries and other  
30 types of lumen so that vital blood flow can be caused to pass through the arteries in the shortest amount of time, thereby decreasing the likelihood of damage due to blood deprivation.

It is an object of this invention therefore to  
35 provide a device of the character described above which can be quickly and safely used to join severed arteries.

A further object contemplates providing a device which when inserted will not be rejected by  
40 the body and will be of small enough dimensions that it will not impair motion.

A further object contemplates providing a device of the character described above which is suitable for arteries of various dimensions located  
45 in various parts of the body.

A further object contemplates providing a joining device which once inserted is capable of being retained in the body substantially indefinitely.

50 These and other objects will be made manifest when considering the following detailed specification when taken in conjunction with the appended drawings.

#### Brief Description of the Drawings

55 Figure 1 is a perspective view of the device according to the present invention;

Figure 2 is a sectional view taken along lines 2—2 of Figure 1 where the latching mechanism is as yet unhooked;

60 Figure 3 is a perspective view of the apparatus according to the present invention in which the sleeve grip and inner cylinder are opened for

inspection; and

Figure 4 details a sectional view similar to  
65 Figure 2 revealing alternative embodiment.

#### Description of the Preferred Embodiments

Referring to the drawings now, wherein like reference numerals refer to like parts throughout the several figures, reference numeral 10 is  
70 directed to the joining device according to the present invention.

This joining device may be regarded as having an innertube (intra-catheter) 1 of substantially cylindrical configuration. Extending from both  
75 ends of the innertube or cylinder 1 is a conically tapered end portion 2 having termini at opposed extremities of the innertube forming truncated ends 12. It is desired that these truncated ends 12 have a feathered edge so that the thickness  
80 thereof is minimal. As shown in the drawings, the severed arteries A are caused to slide over the conical portions 2 up to the cylindrical center portion of innertube 1.

In order to insure that the arteries A thus  
85 disposed will not become dissociated from the conical portions 2, an overlying sleeve grip 21 is provided. As best seen in Figure 2, the sleeve grip 21 has a central portion 3 which is preferably attached to the innertube 1 and free end portions  
90 9 which are caused to overlie the tapered end portions 2 of the innertube 1. Desirably, the sleeve grip 21 is formed from the same material as the innertube 1, and etched teflon has been found to be a suitable substance since it has a very low  
95 likelihood of rejection by the body. The center portion 3 of the sleeve grip 21 has a generally rectangular configuration and dimensions such that when it is rolled over the innertube 1, it completely envelops same. The free end portions  
100 9 have a taper so that they may securely engage the tapered end portions 2 of the innertube 1 and affix the artery firmly thereto. To this end, slits 11 are disposed on opposed sides of the central portion 3, and fenestrations 8 are disposed along  
105 the entire sleeve grip 21. The marginal top and bottom edge portions 2 of the sleeve grip 21 are provided with thickened areas 4 and 7 which serve to support and house the fastening devices so that when the sleeve grip 21 is rolled over the  
110 innertube 1 and tapered portions 2 it can be locked over the arteries A. As shown in Figure 2, male fasteners 5 are provided along one thickened area 4, and a spade type configuration is found to be a suitable and reliable fastening device. The  
115 opposed thickened area 7 is provided with recesses 6 and having a spade like configuration so as to receive the male fasteners 5. The area 13 that joins the innertube 1 to the central portion 3 of the sleeve grip 21 has a thickened portion 14  
120 for additional structural rigidity, somewhat similar to the thickened areas 4 and 7 along the edge portions of the sleeve grip 21.

In use and operation, a suitable example would take the following form. The intra-catheter 1  
125 would be approximately 5 millimeters long having an inside diameter of 1 millimeter. Formed from

teflon, the device 10 would retain the desirable properties of low rejection factor, minimal tissue disturbance, and at the same time remain pliant. The resiliency and pliancy should be sufficient to withstand deformation by the sleeve grip 21. The thickness of the wall of the innertube 1 should be adjusted to compensate for the overall tapering and to allow a 1 mm flow throughout the lumen or passageway. The wall thickness should taper to a very fine feather edge at truncated ends 12, and the back wall of the innertube 1 is attached to the sleeve grip 21 for 2 mm in length leaving 1 1/2 mm of each tapered portion to allow the artery to slide thereover after it has been properly dilated.

The fenestrated sleeve grip 21 will also be 5 mm in length and conforming to the taper of the end portions 9 allowing slightly less space between itself and the innertube 1 than the thickness of the arterial wall (approximately 1 mm). The dimension and number of fenestrations 8 can be adjusted to permit the desired tension so as to produce a "Chinese finger lock" effect on the arteries A when same is under a pulling stress. The male fasteners 5 can be formed from teflon and the female joiners could be made of silastic thick enough to permit a snap coupling with the male fasteners 5.

Of course the dimensions and materials of this prosthesis device are merely illustrative since it is contemplated that various dimensions for this sleeve grip 21 and innertube 1 be provided to accommodate arteries A of various dimensions. It is also contemplated that the sleeve grip 21 and the innertube 1 can be of any desired length to permit anastomosis of vessels and arteries that have been avulsed for several millimeters.

Further it should be clear from Figure 4 that the sleeve grip 21 may not be joined initially to the innertube 1, since these components can be more readily manufactured separately and joined later.

Having thus described the invention, it should be apparent that numerous structural modifications are contemplated as being part of this invention as specified hereinabove and as defined hereinbelow by the claims.

#### CLAIMS

1. A device for joining arteries and the like

comprising an innertube having a central portion of substantially uniform cross section, said inner tube having a central opening therethrough which terminates at opposed extremities thereof to open ends, and having end portions on opposite sides of said central portion, said innertube end portions having a generally tapering cross section adapted to receive an artery or vein thereover, and one-piece gripping means having a central portion movable into overlying engagement with said innertube central portion and oppositely disposed, tapering end portions movable independently of said gripping means central portion into overlying retaining engagement with an artery disposed on said innertube end portions.

2. The device of claim 1 in which a terminal portion of each of said innertube end portions is provided with a fine feathered edge.

3. The device of claim 2 in which said gripping means includes a blank of material which can be wrapped over said innertube.

4. The device of claim 3 in which said blank is affixed to said innertube central portion along the central area thereof.

5. The device of claim 4 in which said blank is provided with fenestrations.

6. The device of claim 5 in which said blank is provided with a reinforced area at the juncture with said innertube inner portion.

7. The device of claim 6 in which said gripping means is provided with reinforced areas extending along the marginal extremities of said blank parallel to said innertube central portion.

8. The device of claim 7 in which said reinforced areas are provided with male and female fasteners so that gripping means can overlie said innertube central and end portions and be fastened.

9. The device of claim 8 in which said male and female fasteners comprise spade-shaped lugs and recesses.

10. The device of claim 9 in which said gripping means central portion is separated from said gripping means and portions by means of slits.

11. A device for joining arteries and the like substantially as hereinbefore described with reference to the accompanying drawings.